

An option to buy a stock is priced at \$200. If the stock closes above 30 on May 15, the option will be worth \$1000. If it closes below 20, the option will be worth \$0, and if it closes between 20 and 30 (inclusively), the option will be worth \$200. A trader thinks there is a 50% chance the stock will close in the 20-30 range, a 20% chance that it will close above 30, and a 30% chance that it will fall below 20 on May 15.

a) How much does the trader expect to gain by buying the stock option?

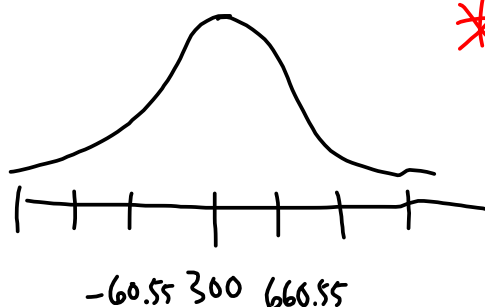
b) What is the standard deviation?

a)

Category	Payout (x)	Probability $\rightarrow P(x)$
Over 30	\$1000	0.20
20-30	\$200	0.50
Less than 20	\$0	0.30

$$\begin{aligned}\mu = E(x) &= \sum x P(x) \\ &= (\$1000)(0.2) + (\$200)(0.5) + (\$0)(0.3) \\ &= \$300\end{aligned}$$

$$\begin{aligned}b) \sigma &= \sqrt{\sum (x - \mu)^2 P(x)} \\ &= \sqrt{(1000 - 300)^2 (0.2) + (200 - 300)^2 (0.5) + (0 - 300)^2 (0.3)} \\ &= \$360.55\end{aligned}$$



\* Large standard deviation compared to mean, so you can lose or gain money very quickly!

You draw a card from a deck. If you get a red card, you win nothing. If you get a spade, you win \$5. For any club, you win \$10 plus an extra \$20 for the ace of clubs.

a) Create a probability model for the amount you win.

26 red cards

b) Find the expected amount you'll win.

13 spades

c) What would you be willing to pay to play this game?

13 clubs

a)

Category	Outcome (X)	P(x)	
Red	\$0	0.5	(26/52)
Spade	\$5	0.25	(13/52)
Club	\$10	0.23	(12/52)
Ace of club	\$30	0.02	(1/52)

1 ace clubs

$$b) \mu = \sum x P(x)$$

$$= (\$0)(0.5) + (\$5)(.25) + (\$10)(.23) + (\$30)(.02)$$

$$= \$4.15$$

$$c) \text{ breaking even} = \$4.15$$

$$\text{profit for you} < \$4.15$$

$$\text{loss for you} > \$4.15$$

An archer hits bull's-eyes with 80% of her arrows. What's the probability that:

a) she never misses in 10 shots?

$$\text{binompdf}(10, 0.8, 10) = 0.107$$

b) there are exactly 8 bull's-eyes in 10 shots?

$$\text{binompdf}(10, 0.8, 8) = 0.302$$

c) there are no more than 8 bull's-eyes in 10 shots?

$$1 - (P(9 \text{ bull's-eyes}) + P(10 \text{ bull's-eyes})) = 0.745$$

d) she gets exactly 12 bull's-eyes in 20 shots?

$$\text{binompdf}(20, 0.8, 12) = 0.022$$

e) she gets at least 12 bull's-eyes in 20 shots?

$$P(X) = {}_{20}C_{12} (0.8)^{12} (0.2)^8 = 0.99$$